Preface

In current computer technology, the most obvious role of chemistry is that involving the study of solid-state inorganics. Diode and transistor fabrication techniques involve silicon, germanium and III-V species like gallium arsenide. Selective and nonselective etching, passivation and doping are representative of the chemical processes involved.

Polymeric materials, however, are now being used in increasing quantities. Some polymers, like the epoxy resins that serve as electrical insulators and structural components in printed circuit boards, and the polyurethanes that are used for their protective coating capability, become integral parts of functional units. Others, like the silicone polymers, are used to hermetically seal solid-state devices, thereby assuring stable performance in a defined environment. Some chemical species, although necessary to manufacture solid-state componentry, do not appear in the final product. Typical of these are the light-sensitive polymers (or photoresists) used to selectively mask or protect substrates such as copper and silicon during etching, diffusion and passivation operations.

The refinement of chemical processes such as these and the introduction of new technology and materials are predicated on a broad program of continuing research and development. Seven papers in this issue on various topics in chemical science provide a partial reflection of the range of IBM interests in the chemical field other than solid-state inorganic chemistry. A second group of papers, to be published in the March issue, describes work on the structure and mechanical properties of materials.

In the current issue, the paper by Kwok, Langlois and Ellefsen (p. 3) stresses the importance of atmospheric chemistry, used in conjunction with computer techniques, for safeguarding the atmosphere. H. E. Hunziker describes a new approach to kinetic spectroscopy (p. 10), based on the modulation of photo-initiated energy transfer reactions, that makes possible the observation of triplet-state absorption spectra in the gas phase and has application to the study of neutral atom reaction rates, radical reactions and the kinetics of short-lived molecules. By means of improved experimental methods, G. Castro (p. 27) has extended observation of intrinsic photoconduction in organic crystals to benzene, biphenyl, naphthalene and pyrene and has identified the photogeneration mechanism in each case. R. Srinivasan (p. 34) has documented the 1,4-cycloaddition of mono-olefins to benzene in addition to providing the first kinetic data on the 1,3- and 1,4-cycloaddition reactions of such olefins to benzene in the liquid phase. In their paper on liquid crystalline nitrones, Young, Haller and Aviram (p. 41) not only describe the synthesis and thermodynamics of new materials, but also provide information on the effect of changes in molecular structure on mesomorphic properties and the ordering forces responsible for mesomorphism in aromatic molecules. Vogel, Barrall and Mignosa, in studying cholesteric liquid crystals (p. 52), have shown that the solid-to-mesophase transition can be depressed by impurities that do not alter the thermodynamics of the mesophase; they have also extended the observation of certain nematic and smectic phenomena to cholesteric systems. C. S. Yannoni's work in nuclear magnetic resonance spectroscopy (p. 59) describes an unambiguous method of measuring the magnetic shielding anisotropy of nuclei in solute molecules that have been aligned in a nematic liquid crystal solvent.